THE INITIATION OF REPLICATION IN BACTERIA : A SINGLE-MOLECULE STUDY

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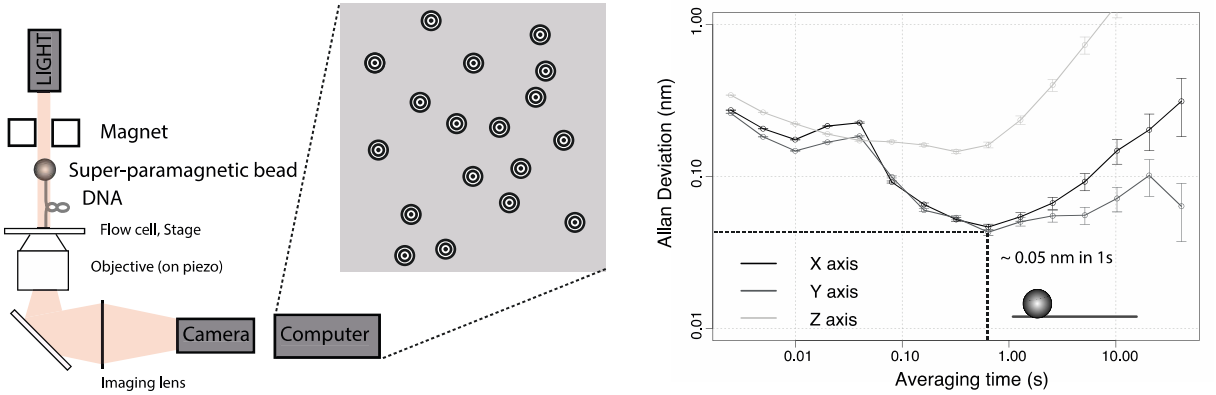
This project aims to study the initation of replication in bacteria. In particular, we will study a class of plasmids that have *ori* structures similar to that of drug resistance plasmids from Gram-positive and Gram-negative bacteria. For this purpose, we will be using a state-of-the art single molecule technique (Magnetic Tweezers) that operates at high spatio-temporal resolutions and allows measurements on tens of molecules in parallel. We will evidence for key rate-liming steps (using point mutations at specific positions, e.g. upstream the ori) and determine their implications in the regulation of gene expression and replication. Knowledge of biology is not required but the successful candidate should show a strong interest for molecular biology and biochemistry (part of the biological samples will be obtained in collaboration).



Left Panel: Magnetic Tweezers set-up. Here, a single molecule is attached on one end to a glass surface and at the other end to a superparamagnetic microsphere. Using a slightly coherent source of light (that generates diffraction rings around the beads), the x, y and z positions of the beads can be determined with sub-nanometer accuracy. The magnetic field (produced by a pair of permanent magnets) is homogeneous over large distances (mm, parallel to the glass slide) and varies slowly with the distance (perpendicular to the glass). Therefore, multiple beads (up to hundreds of beads) can be studied in parallenl at a constant force. Right Panel: Floor noise of our set-up. Allan deviation (*i.e.* noise at a given bandwidth) along x, y and z (perpendicular to the glass surface) for a 3 microns bead (melted on the surface). 126 nm per pixel. 400 Hz. No drift correction. Here, the enclosure (around the set-up) was open and there is some acoustic noise contribution.